SHOUT
SHARE
IT

EXPERIMENT
STATION LIBRARY

Class 639.73

Number N53

Volume 3 cop 2

Source Binding

Received July 1909

Cost

Accession No. 15435

Bulletin 121 **December, 1905**

NEW HAMPSHIRE COLLEGE

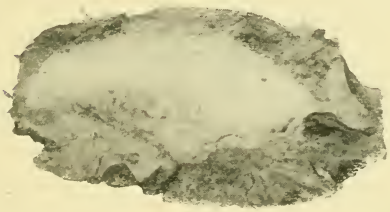
Agricultural Experiment Station

IN COÖPERATION WITH THE

State Board of Agriculture

THE GYPSY MOTH

IN NEW HAMPSHIRE



EGG MASS OF THE GYPSY MOTH ON BARK
The vital stage in which to destroy the pest

By E. DWIGHT SANDERSON
Entomologist to the Station and State Nursery Inspector

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM

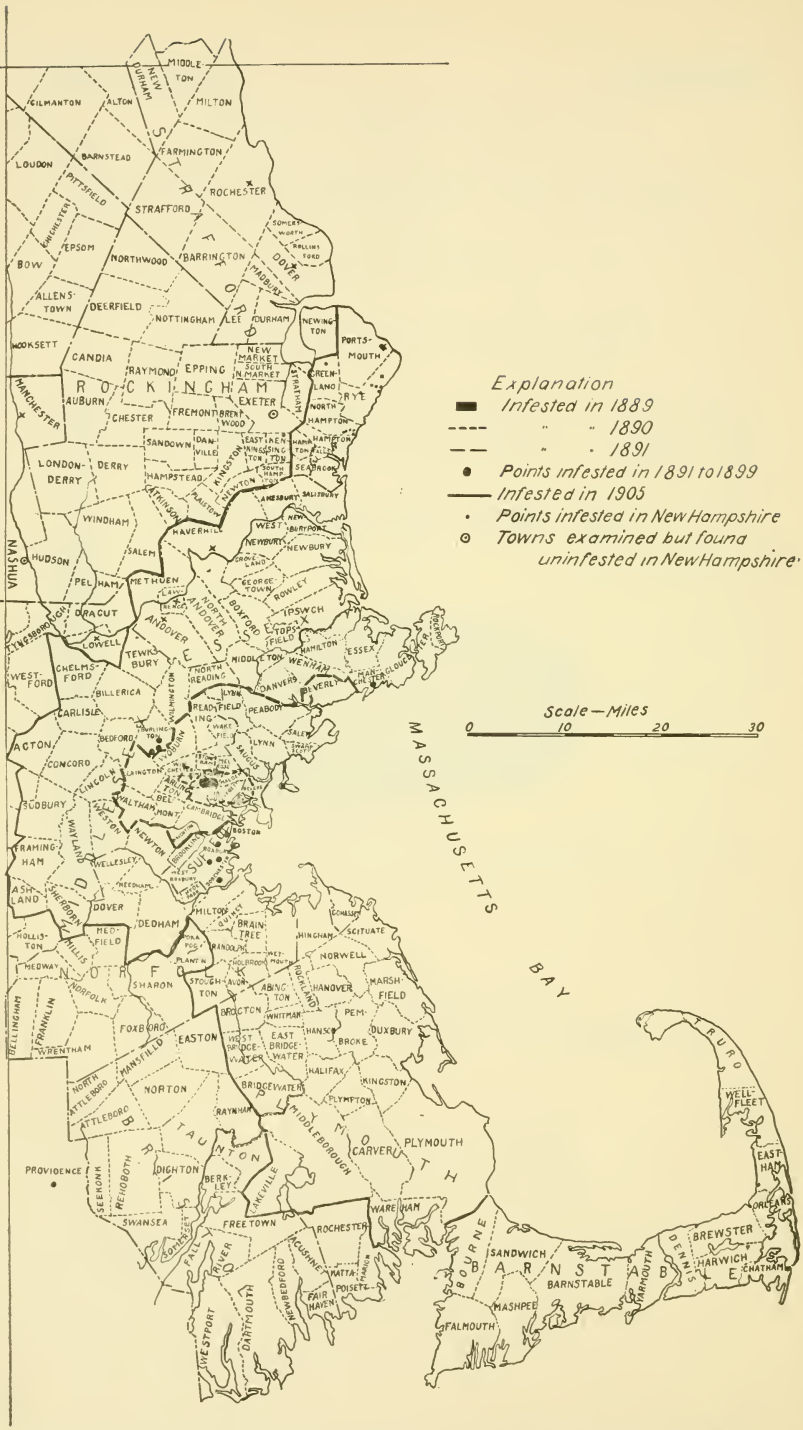


FIG. 1.—Map showing gradual spread and present distribution of the Gypsy Moth.

THE GYPSY MOTH.

HISTORY.

The gypsy moth has been known as a serious insect pest in Europe from the time of the earliest naturalists, the first authentic record being in 1662. It extends throughout the continent of Europe, over much of Asia and into Northern Africa, but is chiefly injurious in Central and Eastern Europe. There it frequently does serious injury by defoliating large areas of forest and more frequently fruit and shade trees, but its ravages cease in two or three seasons, not to occur again for several years, like those of many of our native insects, such as the Forest Tent Caterpillar and Tussock moth. In 1868 the insect was brought to this country by Prof. Leopold Trouvelot at Medford, Mass., in his experiments in silk producing. Escaping from him into the neighboring woodland, the insect increased gradually for several years before noticed, but in 1890 had become such a serious pest throughout this and neighboring towns that the State of Massachusetts commenced the arduous task of its extermination. In 1890 the insect had invaded some twenty towns, from Cambridge on the south to Lexington on the west, and Reading and Beverly on the north, as shown in Figure 1. This work was ably carried on by the Gypsy Moth Commission and the Massachusetts Board of Agriculture, who annually employed a small army of men in the fight, and who expended up to 1900 approximately a million and a quarter of dollars. As a result, so few of the moths could be found in 1899 and so little damage was caused by the insect, that the Legislature of 1900, probably not realizing the necessity of continuing control measures, stopped the work. Had a small annual appropriation been made and continued at this time, the future spread would undoubtedly have been prevented and the control of the insect

become more and more effectual, though utter extermination might never have been possible. However, in 1898, "in seven of the formerly infested towns no gypsy moths were found. In five others but one to three small spots were found infested, and in these no eggs were found in the fall inspection; in the other outer towns comparatively few moths were found." (Forbush.) In 1898 the insect had spread to but three towns outside those infested in 1890, when the work began. The possibility of the practical control of the pest was, therefore, thoroughly established.

The Present Condition.—Since 1900 the only effort toward control has been by local towns and private parties, with but partial success, owing to the lack of concerted action. In 1904 the moth had increased so enormously that it became evident that state aid was again necessary for its control and the Massachusetts Legislature of 1905 made an appropriation of $150,000 per annum for aiding the towns in the work. Under this act a state superintendent, appointed by the governor, Mr. A. H. Kirkland, formerly assistant-entomologist to the Gypsy Moth Committee, has general oversight of all the work. During the past season inspections made by his assistants show that the moth has spread in Massachusetts to some one hundred and twenty towns, extending north to the New Hampshire line, west to Chelmsford, Concord and Sherborn, and south and east to Plymouth, extending over four times the area previously infested. At the present time, in addition to the state appropriation, private citizens of Massachusetts are spending about $125,000 to protect their property and the towns and cities are spending some $75,000 to protect their street trees. Notwithstanding this, during the last few years while no state work was being done, acres of valuable pine and soft-wood timber, and hundreds of stately shade trees have been killed by the caterpillers, while hundreds of acres of woodland are now so badly infested that it is questionable whether it will be profitable to attempt the control of the insect upon them.

FIG. 2.—Egg masses of Gypsy Moth on bits of bark cut from tree trunk, natural size.

LIFE HISTORY.

Like all insects of its class, the gypsy moth passes through four different stages during its life history.

The Egg.—(Figure 2.) The eggs are laid in July and August, in a mass of 400 to 500, covered with yellowish hairs from the body of the female. The individual mass is of an irregular oval shape, one and one-half by three-fourths inches, as shown natural size in Figure 2, and is usually deposited on the bark of trees, but where abundant on fences, stones, buildings, etc.

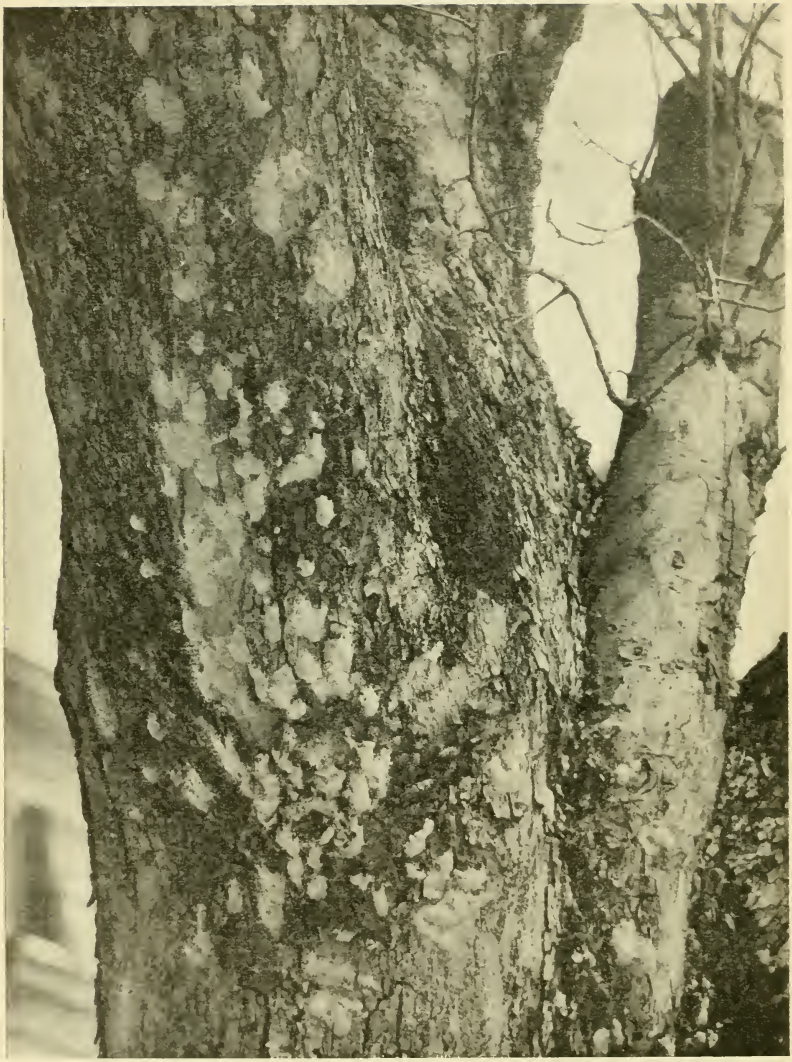


FIG. 3.—Egg masses on neglected apple tree, Arlington, Mass., March, 1905.

FIG. 4.—Eggs of Rusty Tussock Moth. (*Notolophus antiqua* Linn.)

The eggs of two species of our common tussock moths might be readily mistaken for those of the gypsy by one unfamiliar with the latter. The eggs of the Rusty Tussock moth (*Notolophus antiqua* Linn.), which is the more common species, except in Southern New Hampshire, are usually laid on the leaves which remain attached to the tree and are laid in but a single layer with no protecting cover over them, so that each egg is distinguishable, as seen in Figure 4. The eggs of the common White-Marked Tussock moth (*Hemerocampa leucostigma* S. & A.), which is common in Southern New Hampshire and southward, often doing serious damage to shade trees in the cities of the Middle States, are covered with a white frothy substance and laid in a compact mass upon the trunk or limbs of a tree, and are not unlike the egg masses of the gypsy moth. The mass of the tussock moth is pure white, while that of the gypsy is yellowish or dark creamy, from the hairs or scales from the body of the female which cover it, which are entirely absent from the eggs of the tussock moth. The eggs of the tussock moth (see Figure 5, which illustrates the well-known tussock caterpillar), are usually laid on the cocoon from which the female emerged, while those of the gypsy moth are laid directly on the bark of the tree.

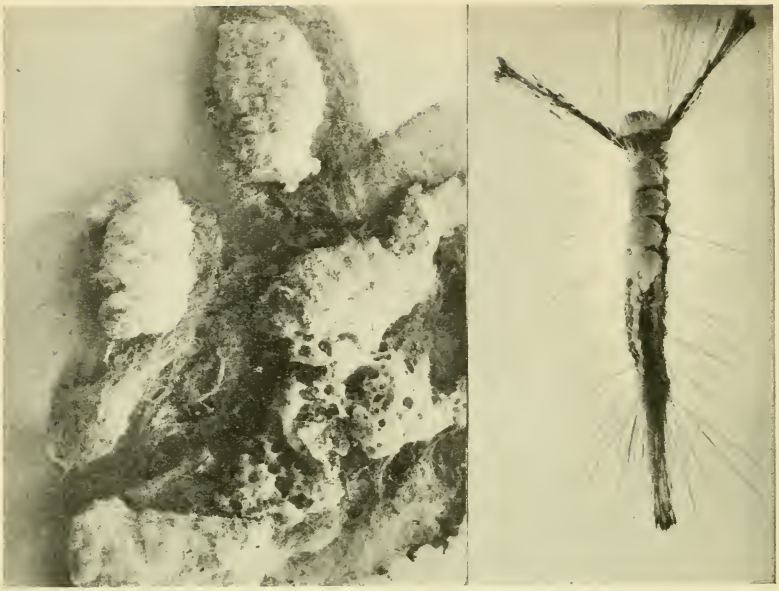


FIG. 5.—Eggs of White-Marked Tussock Moth on cocoons of females, and full-grown caterpillar, natural size.

The Caterpillar or Larva.—(Figure 6.) "The eggs hatch about May 1 and each mass or 'cluster' yields a swarm of young caterpillars, the bulk of which become full grown by midsummer. Gypsy moth caterpillars of any age are decidedly hairy. The mature caterpillar has a dusky or sooty-colored body. Along the back, counting from the head, which is marked with yellow, is a double row of five pairs of blue spots, followed by a double row of six pairs of red spots. This double row of spots may almost invariably be seen very distinctly on the back of a caterpillar which has attained a length of one inch and a half or more. No other New England larva has this double row of blue and red spots along its back. The mature gypsy moth caterpillar not infrequently attains a length of three inches."* The

*From Bulletin 1, Office of Superintendent, for Suppressing the Gypsy and Brown-tail Moths, of Massachusetts, by A. H. Kirkland, from which are all other quotations, unless otherwise indicated, and to which we are indebted for much of the present article not directly quoted.

THE GYPSY MOTH.

FIG. 7.—Female laying eggs. FIG. 6.—Full-grown caterpillars. Pupa.
All life size (after Kirkland

caterpillars become full grown during July, mostly about the first. Injury done by the pest is, therefore, largely confined to the months of May and June, being most serious as the caterpillars become grown.

The Pupa.—"When fully grown, usually in July, the caterpillar spins a few threads of silk as a supporting framework, casts its skin and changes into a pupa, or, as it is sometimes called, a chrysalis. The pupa is dark reddish or chocolate in color and very thinly sprinkled with light reddish hairs. Unfortunately, it resembles the pupæ of certain other moths found in Massachusetts (and New England), and cannot, unless by experts, be identified at a glance. The thinly sprinkled, light reddish hairs are, however, characteristic." The pupa stage lasts from 10 days to two weeks, during which time the insect is comparatively dormant, while the wonderful changes take place by which the tissues of the worm-like caterpillar are so transformed that from the apparently lifeless pupa, the winged, adult moth emerges.

FIG. 8.—Male and Female Gypsy Moths. Natural size. (After Forbush and Fernald.)

The Moth.—(Figure 8.) "From July 15 to August 15 the winged moths emerge from the pupæ, the date varying according to the season and the time of

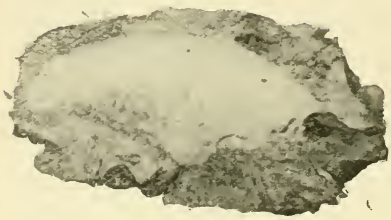
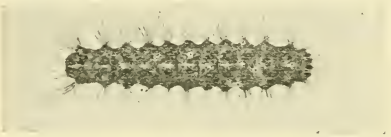
pupation. The male moth is brownish yellow, varying to greenish-brown in color, has a slender body and expands about one and one-half inches. It flies by day with a peculiar zig-zag flight.

"The female moth is nearly white, with numerous small black markings, heavy-bodied and sluggish, and expands about two inches. The female does not fly, otherwise the spread of the gypsy moth would be most rapid. After mating the moths live but a short time. The female dies after depositing her egg mass (Figure 7.) The winged moths take no food. All damage to foliage is caused by the caterpillars."

The eggs remain over winter on the trees, as already described. Thus, there is but one brood or generation of the gypsy moth in a year, the different stages of which in their relation to each other are shown graphically in Figure 9.

In view of the fact that the brown-tail moth has also recently been introduced into the state and that it is frequently confused with the gypsy moth, the following table may be of service in sharply distinguishing the two species, which are totally different in habits and require different methods of control:

THE STAGES AND LIVES OF THE GYPSY MOTH

Stages.	Gypsy Moth.
Egg Cluster	Usually on bark of tree; very rarely on leaf. Robust, 1½ to 2 inches long. Light yellow or creamy. From August to May.
	
Caterpillar. Full grown	Dark grayish or sooty. Double row of five pairs of blue, followed by six pairs of red spots along back.
	
Moth. Female	Wings spread 2¼ in. Dingy-white, lightly streaked and blotched with blackish. No brush of brown hairs at tip of abdomen. Does not fly, crawls.
Winter Passed	In egg stage—see above. Never as a caterpillar.
Irritation of Human Skin	Not caused by any stage.
Most Effective Means of Control. Soak eggs with creosote in fall, winter, or spring.	

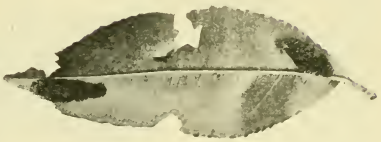
AND BROWN-TAIL MOTH CONTRASTED.

Brown-Tail Moth.

Always on under side of leaf.
Smaller and more slender.
Dark or golden brown.
July.

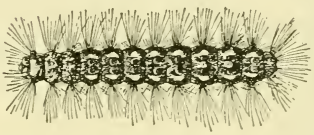
Stages.

Egg Cluster.



Caterpillar.

Bright tawny or orange.
A conspicuous row of pure white spots or dashes along each side of body. Only two bright red spots on middle line at lower end of back.



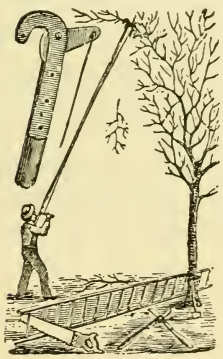
Moth, Female.

Wings spread 1½ inches.....
Pure snow white.

A conspicuous, sharply contrasted, thick tuft or patch of golden or brownish hairs at tip of abdomen.
A swift, strong flyer, by night, and attracted to lights.

Winter Passed.

As small caterpillars in a silken web or nest on tips of twigs, from which they crawl out in spring.



Irritation.

Hairs from caterpillars, which are often transferred to cocoons and moths, cause an annoying and painful irritation of the skin.

Most Effective Means of Control.

Cut off and burn webs in winter.

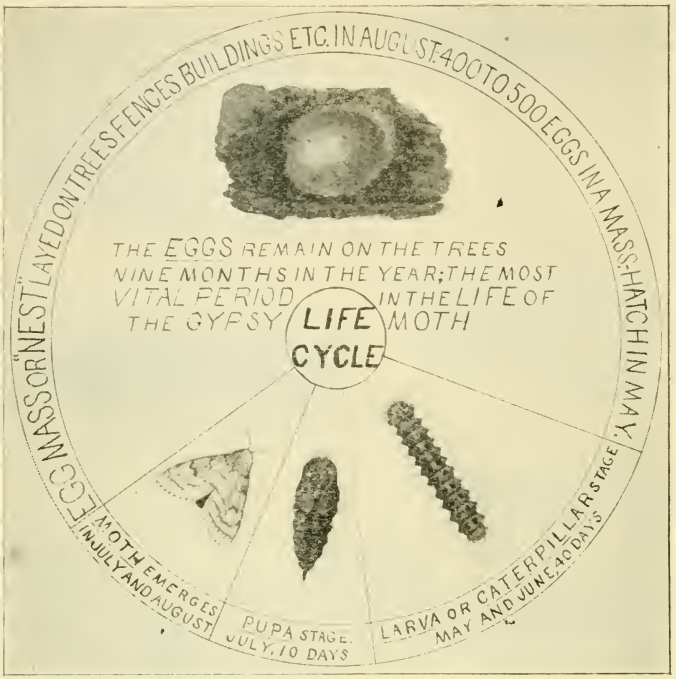

EGG MASS OR NEST LAYED ON TREES FENCES BUILDINGS ETC. IN AUGUST 400 TO 500 EGGS IN A MASS HATCH IN MAY
THE EGGS REMAIN ON THE TREES NINE MONTHS IN THE YEAR; THE MOST VITAL PERIOD IN THE LIFE OF THE GYPSY MOTH
LIFE CYCLE
MOTH EMERGES IN JULY AND AUGUST
PUPA STAGE. JULY. 10 DAYS
LARVA OR CATERPILLAR STAGE MAY AND JUNE 40 DAYS

Fig. 9.—The Life Cycle of the Gypsy Moth. (Figures after Forbush and Fernald.)

MEANS OF DISTRIBUTION.

"The gypsy moth spreads chiefly during the caterpillar stage. While the caterpillars do not crawl very far from where they hatch, except when there is a scarcity of food, they have the habit, when small and young, of spinning down on their silken threads from trees (as do the canker worm caterpillars in orchards), and, falling on vehicles, are then carried from place to place. Electric cars, pleasure and business vehicles, bicycles and automobiles are common means of thus transporting the gypsy moth.

"The special attention of all those upon whom gypsy moth suppression devolves is, therefore, directed to the necessity of keeping travelled highways free from the insect.

The caterpillars often crawl upon vehicles standing in an infested spot and by this means, also, are carried from one place to another.''

The writer has no doubt that practically all of the infestations of gypsy moth in New Hampshire have been introduced by automobiles, as they are practically the only vehicles, other than railroad cars, coming directly from the badly infested region of Massachusetts, and the infestations are found along the main roads and not near the railroads. Indeed, one case has come to our attention in which the owner of an automobile coming from Malden, Mass., removed a half dozen caterpillars from his machine upon arriving at Greenland, N. H., which were believed to be, and doubtless were, those of the gypsy moth.

''The egg clusters of the gypsy moth may also be transported on any of the numerous objects on which they are laid. Freight cars that have stood near the infested foliage for a period long enough for the laying of gypsy moth eggs upon them may even transport the pest.'' It is surprising, however, that as yet no instances have become known in which freight cars have carried the eggs, so that a colony of the moth has arisen at any distance from the badly infested regions, though certainly abundant opportunity must have arisen in past years.

DISTRIBUTION IN NEW HAMPSHIRE.

Realizing the probability of the spread of the gypsy moth into New Hampshire by the large amount of automobile traffic along the main road from Newburyport, Mass., to Portsmouth, N. H., in December, 1904, the writer had the trees along it examined through the towns of Seabrook and Hampton Falls by two trained assistants. No traces of infestation, however, were found at this time. Inspection during the present fall shows that no infestation along this road existed in 1904.

In September, 1905, the inspectors of Massachusetts had located the pest in all of the towns along the northern

boundary of Massachusetts from Methuen eastward, and discovered that it had existed in Newburyport since 1904. It was, therefore, apparent that the neighboring towns of New Hampshire were undoubtedly infested. Through the courtesy of the Massachusetts superintendent for suppressing the gypsy moth, Mr. A. H. Kirkland, we secured the services of one of the most experienced of the Massachusetts inspectors, who, in company with our assistant, Mr. W. P. Flint, inspected all the towns along the coast from the Massachusetts line to and including the City of Portsmouth. The pest was found in all of these towns, though only the main road and the village streets were examined, except in Portsmouth, where practically the whole city was inspected. But a small portion of each town was, therefore, examined, merely enough being inspected to establish the existence of the pest and something as to its relative abundance. One or two examinations of back roads, not so much travelled as the main road, revealed, however, the presence of eggs along them. In two of these infestations the pest had been introduced in 1904, from 25 to 30 egg masses were found this year, and the caterpillars had spread from the original point to nearby orchards, 200 yards distant. The number of infestations found and their nature were as follows:

In town of Seabrook, 14 infestations; 21 egg "nests," two pupal, or larval, skins.

In town of Hampton Falls, six infestations, eight egg "nests."

In town of Hampton, 14 infestations; 17 egg "nests."

In town of North Hampton, five infestations; 30 egg "nests" (one nest of 1904).

In town of Greenland, one infestation; one pupa skin.

In town of Rye, seven infestations; 35 egg "nests" (one nest of 1904); two pupa skins.

In City of Portsmouth, two infestations; three egg "nests."

Total: In seven towns inspected, 49 infestations; 114 egg "nests"; five pupal skins; two egg "nests" of 1904.

The infested points are indicated upon the map (Figure 1). It is interesting to note that practically all of the infestations were on apple trees. In all cases the egg masses were immediately creosoted, so that the pest is probably exterminated over all the immediate territory actually examined, all trees being examined for 200 feet back from the roads, though an inspection next year will be necessary to determine that no scattered eggs may have developed. The Cities of Exeter and Nashua were also thoroughly inspected, but no trace of gypsy moth was found. It might be thought possible that any of the territory within the same radius from the worst districts in Massachusetts as Portsmouth might be found infested, but this is hardly probable. The summer travel along the coast much exceeds that up the Merrimack Valley or toward Exeter. Indeed, in Massachusetts the spread has been much faster to the northeast and the pest has not been found in Lowell. It seems fairly safe to conclude, therefore, that infestation in New Hampshire is probably confined to Rockingham County east of the Western Division of the Boston & Maine Railroad. It is of the utmost importance that the towns in this district which have not been inspected be examined, including Atkinson, Hampstead, Newton, South Hampton, Kingston, Newington and also Dover and Rochester in Strafford County, as the latter are on the route of automobile travel to the mountains.

FOOD PLANTS AND INJURY CAUSED.

"The gypsy moth caterpillar will attack all fruit, shade and woodland trees. It shows a preference for the apple, white oak, red oak, willow and elm. It will devour on occasion nearly every useful grass, plant, flower, shrub, vine, bush, garden or field crop that grows in Massachusetts (or New Hampshire).

"The caterpillar kills both deciduous (or hard-wood) and coniferous (soft-wood or evergreen) trees. Woodlands assailed by it in formidable numbers are stripped bare, as

FIG. 10.—A piece of woodland at Arlington, Mass., typical of many, killed by defoliation by Gypsy Moth caterpillars in 1904. Taken March, 1905

in winter, and many trees are killed. While several consecutive strippings are usually necessary to cause the death of a healthy deciduous tree, one thorough stripping will kill the white pine and other coniferous trees.'' Figure 10 shows the effect of a single stripping upon pine and spruce at Arlington, Mass., in 1904, the photo being taken by the writer in March, 1905. These trees were totally dead and fit only for firewood. Throughout acres of woodland in the worst infested district in Massachusetts the pines, spruces and hemlocks have been almost entirely destroyed and the piles of cordwood attest the devastation wrought by the gypsy moth caterpillar. ''Where the gypsy moth abounds in residence districts, it not only eats nearly everything green, but it swarms, in caterpillar form, upon houses, walks and verandas and often enters dwellings. In residential districts most heavily infested by the moth real estate tends to rapid depreciation, so that it sometimes becomes a matter of difficulty to rent or sell property.'' Such instances now exist, as shown to the writer.

NATURAL ENEMIES.

''While the gypsy moth is a serious enemy of trees, it has its own foes in the shape of predaceous insects, parasites and birds. Several ground beetles prey on the caterpillars, while true parasitic insects attack both larvæ and pupæ. Several species of birds, notably vireos and cuckoos, consume large numbers of the caterpillars, while others, like the chewink, chickadee, blue jay and crow, do their part in reducing the numbers of the pest. The service of these natural tree protectors is worthy of high praise, but in attempting to control the moth the main reliance must be placed on human efforts—on the timely and thorough application of the remedial measures outlined'' below. As yet the native enemies have not shown ability to materially check the increase of the pest.

It is well known that in Europe the insect seems to be largely controlled by its natural enemies, so that serious

outbreaks occur but once in a number of years in any one locality, in the same manner as do outbreaks of our native insects, such as the forest tent caterpillar or white-marked tussock moth, which are controlled by native parasites. A determined effort is, therefore, now being made by the Massachusetts superintendent, in coöperation with the Bureau of Entomology of the United States Department of Agriculture, in importing those parasites and predaceous

FIG. 11.—Killing the eggs of the Gypsy Moth in woodland, showing the large amount of labor and expense involved in combating the pest in badly infected districts. (After Forbush and Fernald.)

insects which prey upon the gypsy moth in Europe. Already large numbers have been imported from all parts of Europe and are being carefully reared in strict confinement at Saugus, Mass. It is the hope of everyone that these importations may result, within a few years, in such an increase of these enemies that they will be able to control the gypsy moth. It is the belief of the writer that ultimately either imported or native enemies of the gypsy moth will control it, as they do our native insects; but Nature works slowly, and whether such a condition will arise in five, ten or

one hundred years, it is impossible to predict, as we have no experience with imported pests of a nature sufficiently similar to furnish us any precedent for comparison. Obviously, therefore, it will be folly to place any dependence upon these natural enemies until their value and ability to even partially control the gypsy moth is clearly established, for meantime, if not controlled by the means already well known and which have been found effective, a condition might arise which would make it impossible to cope with the pest and we would be left comparatively helpless in attempting to control it in woodlands and forests.

REMEDIES.

Killing the Eggs.—"No single method of destruction against the gypsy moth is more effective than killing the eggs. The egg masses, wherever accessible, can be killed from August to May by soaking them thoroughly with creosote mixture. The creosote may be applied with a small swab or paint brush. In killing gypsy moth eggs in high trees, it is usually best to work with two men; one man to point out the egg clusters from the ground, another to kill the eggs in the trees. (Figure 11.) Creosote mixture may be purchased at agricultural warehouses and seed stores at from 50 cents to $1 per gallon, depending on the quantity."

CATERPILLAR DESTRUCTION.

Spraying.—"Spraying with arsenate of lead at the rate of 10 pounds to 100 gallons of water is very effective when the caterpillars are small. Any of the common hand outfits will suffice for the spraying of shrubs or flowering plants, but for use on trees a barrel pump is desirable. The poison should be thoroughly mixed in water and applied, if possible, on a clear day, in such a manner as to cover the leaves rather slowly, with a fine mist. The foliage should never be drenched with a stream. When the leaves begin to drip spraying should cease at once. Spraying should begin at the top of the trees. The work is most effective when done

during May and early June." Where orchards are to be sprayed, this spraying may be combined with that which should always be given for the codling moth and diseases.

Burlapping.—"When a loose band of burlap or other cloth is tied about an infested tree trunk, the caterpillars will gather under it in the early morning and may be destroyed by hand. The burlaps should be examined daily." "This cloth band is in no sense a tree protector; nor is it a trap. Its function is simply to give the shelter which the caterpillars seek by day." Unless carefully attended the burlap band does more harm than good. All burlaps should be removed at end of season.

NECESSITY OF THE SUPPRESSION OF THE GYPSY MOTH IN NEW HAMPSHIRE.

It is absolutely essential that the towns in New Hampshire known to be infested with the gypsy moth, or which are liable to be infested, should take immediate action toward having all trees along roadways carefully inspected by a trained man and the egg nests destroyed wherever found.

It is difficult to appreciate the necessity of fighting such a pest as this where it is present in such small numbers as to do no damage, unless one has seen the terrible devastation wrought by it when at its worst. Citizens of southeastern New Hampshire are coming to appreciate, through personal experience, the seriousness of the brown-tail moth caterpillars, but in many respects the gypsy moth is a much more serious pest. It defoliates the trees in June, when it is much more difficult for the tree to put out new leaves, and it is more injured than by defoliation by the brown-tail caterpillars earlier in the spring. Again, the gypsy moth caterpillar attacks pines and all coniferous trees. Should it become established in New Hampshire as in eastern Massachusetts, we have every reason to think that it would cause immense losses to the lumber industry throughout New Hampshire. Unless the spread of the gypsy moth

is checked and it is prevented from reaching north of Rochester, there is every reason to believe that it would do more than all the lumbermen to destroy the scenic beauty of the White Mountains, and a national forest reserve would not prevent its depredations.

As before stated, no funds of the state or of this station are available for further inspection of towns other than that already partially made to determine, as far as possible, the present extent of the infestation. It is imperative, therefore, that each town takes steps for the eradication of the pest within its borders. This should be done by the towns and not left to the individual, for but few people unacquainted with the pest and untrained in looking for it will be able to find a single egg mass in an orchard of 100 trees, as a trained inspector will readily do. The importance of such work being done thoroughly by the town or state and not left to the property owner is indicated by the experiences in Massachusetts. The statements of two citizens quoted in the exhaustive treatise on "The Gypsy Moth," by Messrs. Forbush and Fernald, bear directly upon this: "It is not easy to give outsiders an idea of how bad the caterpillars were. If the state had not done something, I honestly think we should have had to move away from here. We were worn out with catching them. When they were thickest we did not pretend to go out the front door at all." Another says: "Before public measures were taken in the matter, the foliage was completely stripped from all the trees in the eastern part of our town, presenting a picture of devastation and promising in a short time to kill every tree and shrub and all vegetation in any region visited by them; which shows how inadequate individual effort was to cope with the subject." Many others might be quoted in the same strain.

If the establishment of the gypsy moth in New Hampshire is to be prevented, it will be necessary for the towns to destroy any eggs existing in parts not inspected by us before May, 1906. Similar inspection will doubtless also be

necessary in the winter of 1906–1907, as caterpillars will probably again be brought in from Massachusetts as long as the pest exists in the enormous numbers now present there. It is to be hoped, however, that the Legislature of 1907 will enact laws and appropriate funds whereby this and other serious insect pests may be controlled by agents of the state after that time.

Let every citizen who loves and is proud of the grand old shade trees which line the highways of New Hampshire; let every farmer and fruit-grower who wishes to prevent a future heavy tax in combating this pest in his orchards; let every lover of the mountains and forests of the Granite State, join in securing immediate action by the towns in which it is now necessary and in securing suitable state, and if, as now seems necessary, national legislation by the present Congress, to secure the control and prevent the future spread of this pest, which has caused such serious devastation and which, if not controlled within the next year or two, may bring about conditions which no one can predict.

(NOTE.—The writer will be glad to identify any eggs which may be thought to be those of the gypsy moth. In all cases where they are found tightly adhering to the bark, they should be saturated with creosote before removing from the tree, else some may be scattered and sufficient live eggs be left to propagate the pest for another season.)

For the most complete accounts of the gypsy moth published, see: Howard,—Bulletin 11, new series, Division of Entomology, United States Department of Agriculture; Forbush and Fernald, The Gypsy Moth, pp. 495, etc., plates 66: Massachusetts State Board of Agriculture (1896); Kirkland,—Bulletin 1, Office of Superintendent for Suppressing Gypsy and Brown-tail Moths. (Boston, 1905.)

639.73 N53 3 cop. 2
N. H. Exp. Sta.
Buls. 97-129
1903-1907.

639.73
N53
v.3 cop 2